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(54) Abstract Title

**Communication protocol selection scheme which reduces risk of data corruption on a data storage device**

(57) Apparatus for communicating with any of a set of data storage devices, each data storage device having a respective communications protocol, the apparatus being operative to execute an identification procedure so as to determine whether a particular communications protocol is compatible with a particular data storage device and the arrangement being such that, in use, there is provided risk indication means which provides an indication of whether there exists a risk of corruption of at least one data storage device in the set of data storage devices by a particular identification procedure. Hence attempts to use a protocol which may corrupt data are avoided where possible.

The data storage devices may be smart cards.

Advantageously the inventive apparatus requires minimum or no operator intervention and results in a reduced risk of data corruption of data stored on a device.

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

This print takes account of replacement documents submitted after the date of filing to enable the application to comply with the formal requirements of the Patents Rules 1995

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**FIGURE 1**

**Element 1: Data Storage Device Type Identifier**

This is a number which is used as an index for accessing an entry and is also used to specify the protocol for the Data Storage Device.

**Element 2: Risk Restriction Flag**

This specifies whether there is a risk of corruption for other data storage devices in the set if the identification procedure for a data storage device having a particular communications protocol is used.

**Element 3: Action to be taken if the risk restriction flag is set and the risk restriction indicator is turned on. The choice of actions is as follows:**

- (1) Terminate the procedure
- (2) Proceed to the next database entry
- (3) Proceed to a specified database entry
- (4) Present the manual selection menu

**Element 4: First action on failure to identify data storage device**

Turn on or off the risk restriction indicator

**Element 5: Second action on failure to identify data storage device**

Take one of the following actions:

- (1) Terminate the Procedure
- (2) Proceed to the next database entry
- (3) Proceed to a specified database entry
- (4) Present the manual selection menu



**FIGURE 2**

- Step 1:** On detecting the presence of a data storage device, set the index to the first entry in the database. If the initial condition specifier requires the presentation of the manual selection menu, then proceed to Step 3, otherwise proceed to Step 2. Set the risk restriction indicator to 'ON'
- Step 2:** If the current database entry has been automatically tried before, proceed to Step 3, otherwise proceed to Step 4.
- Step 3:** Present the manual selection menu and accept operator input. Terminate the procedure if the operator has so chosen, otherwise set the index to the chosen database entry and proceed to step 4.
- Step 4:** If the risk restriction indicator is on and the risk restriction flag in the database entry is set (Element 2) take the action specified in Element 3, ie
- (1) Terminate the procedure
  - (2) Set the index to the next entry in the database and proceed to Step 2
  - (3) Set the index to the specified entry in the database and proceed to Step 2
  - (4) Proceed to Step 3
- Otherwise proceed to Step 5.
- Step 5:** Execute the associated identification procedure for the database entry and proceed to Step 6.
- Step 6:** If the identification procedure is successful, leave the algorithm indicating success for the specified data storage device type, otherwise proceed to Step 7.
- Step 7:** Set the risk restriction indicator according to Element 4.
- Step 8:** Take the action specified in Element 5, ie
- (1) Terminate the procedure
  - (2) Set the index to the next entry in the database and proceed to Step 2
  - (3) Set the index to the specified entry in the database and proceed to Step 2
  - (4) Proceed to Step 3

If, when proceeding to the next consecutive database entry, the end of the list is reached, terminate the procedure.

## DATA STORAGE DEVICE HANDLING APPARATUS

The present invention relates to apparatus for handling a number of different types of data storage devices and in particular to apparatus for identifying a communications protocol which is compatible with a particular data storage device.

A 'data storage device' is hereby defined as any device capable of containing and updating data, stored in electronic form, which facilitates identification, financial or other transactions, access to property or transport systems, or which contains data of any sort relating to the data storage device-holders person or activities.

Falling within this definition are integrated circuit cards including contactless smart cards, magnetic stripe cards, magnetic ink documents, tagging devices, transponders, embedded (in persons, animals or things) micro-chips and any other similar devices.

The methods of data transfer between the data storage device and the terminal device with which it communicates include electrical or tactile contact, capacitive, inductive, radio, optical, magnetic and acoustic coupling, not excluding developing technologies such as neural and other physiological interfaces.

The integrated circuit card, or smart card, is finding application in an increasing number of areas. These include the credit card, electronic purse, loyalty and personal (eg medical) data.

There are a large number of different types and they fall into two broad categories: those cards which possess a microprocessor and memory and those which have memory only.

Despite the variety, there is an almost universally accepted standard for the position and arrangement of the electrical contacts by means of which a terminal device is able to communicate with the card. There are however variations in the use and signal specifications of the contacts.

- 5 A problem arises when considering the way in which data is transferred between the terminal and the card: the communications protocol. One such communications protocol is the so-called EMV protocol. For those cards equipped with a microprocessor the communication can be compared to a computer serial port while memory-only cards use  
10 methods similar to those for non-volatile memory systems.

At a higher level still, each type of card can employ a different set of message formats and dialogue rules. (This is generally true for all types of electronic data storage device.)

- 15 There exists a standard adhered to by many microprocessor-based cards which provides for a common response when one of the control contacts is activated: the so-called answer-to-reset. This affords a means of identifying the type of card and leads to determining the type of application for which the card is used. This cannot, however, be the solution for all card types.

- 20 There is another problem which has to be considered when a terminal is to read a number of cards having different communication protocols. There are some cases where the deployment of a protocol for one card type on another card type can cause corruption or unwanted modification of the card data.

- 25 Contactless integrated circuit cards do not require physical contact for their operation. Current technology employs low frequency radio signals

emitted by the terminal. Such a card in the proximity of this signal derives power from it and communication proceeds by the modulation of the signal.

5 Protocols exist for the means of communication and for resolving contention when a number of similar cards are in the vicinity of the terminal.

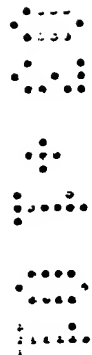
The growing use of this type of card in transportation and other systems will almost certainly lead to the development of different card types.

10 The most familiar type of magnetic stripe device is the credit card. These are also used in many loyalty scheme applications. The card is capable of containing a small amount of data stored using a recognised standard on one or more of three tracks. Equipment exists for reading these cards using either a manual swipe or a motorised reader. Use of a read/write mechanism allows a variety of applications to be implemented  
15 by enabling the data on the card to be updated by the terminal.

Other applications of the magnetic stripe can be found in automatic ticketing systems on surface or underground railways.

There is nothing to prevent the use of different standards using existing or new card or ticket geometries.

20 A very large variety of other devices are evolving such as body implants in people and animals, external tagging of people and animals and security tagging of products. Here, standards are much less universal and it is important to consider ways of recognising the various protocols employed.



According to the invention there is provided apparatus for communicating with any of a set of data storage devices, the set of data storage devices having respective communications protocols, the apparatus being operative to execute an identification procedure so as to determine  
 5 whether a particular communications protocol is compatible with a particular data storage device, and the arrangement being such that, in use, there is provided risk indication means which provides an indication of whether there exists a risk of corruption of at least one data storage device in the set of data storage devices by a particular identification  
 10 procedure.

The inventive apparatus advantageously requires minimum or no operator intervention and results in a reduced risk of data corruption or inadvertent alteration of data stored on a device.

Preferably the apparatus is provided with data on courses of action to be  
 15 taken in the event of the activation of the risk indication means or in the event of an unsuccessful identification attempt.

Preferably the apparatus is provided with data on courses of action to be taken for a particular identification procedure in the event of activation of the risk indication means or an unsuccessful identification attempt.

20 One course of action for particular identification procedures in the event of activation of the risk indication means or in the event of an unsuccessful identification attempt may be to allow for a subsequent step of the operation of the apparatus to be determined manually.

Preferably the apparatus is provided with a database which comprises a  
 25 section corresponding to each type of data storage device in the set.



The invention will now be further described by way of example only with reference to the accompanying figures in which:

5       **Figure 1** shows the elements comprised in a database entry corresponding to a data storage device having particular communications protocol, and

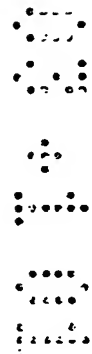
**Figure 2** shows an algorithm employed by an apparatus in accordance with the invention.

10       A data storage device handling terminal (not illustrated) comprises an interface which is adapted to communicate with a data storage device, for example the interface may be provided with a slot suitable for receiving 'smart' cards.

15       The terminal is provided with a memory which stores data on a predetermined set of data storage device types, each type having a corresponding communications protocol. The terminal, via the interface, is capable of communicating with any of the types of data storage device in the set.

20       For each type of data storage device in the set there is provided a data base entry comprising a number of elements, as shown in Figure 1. Furthermore for each data storage device type there is a corresponding identification procedure which is operative to determine whether a particular communications protocol is compatible with a particular data storage device (ie the one in communication with the interface of the terminal).

25       Element 1 is the data storage device identifier which corresponds to one particular type of data storage device.





Element 2 of the entry is the risk restriction flag which specifies whether there is a risk of corruption for at least one of the data storage device types in the set if the identification procedure of that data storage device type is executed. This parameter is dependent on which types of data storage device are present in the set and needs to be determined by the database compiler.

Element 3 specifies which of four possible courses of action should be taken if the risk restriction flag is set and a risk restriction indicator is on. The database compiler will determine which one of those four courses of action is to be taken for each particular identification procedure.

Element 4 of the database entry determines whether, after an unsuccessful attempt at identifying a data storage device type, the risk restriction indicator should be turned on or turned off.

Finally, element 5 specifies which of the four courses of action (as set out in element 3) should be taken in the event of a second unsuccessful identification attempt.

Figure 2 shows a typical data storage device identification algorithm which the data storage device handling terminal employs.

Prior to the execution of the algorithm what is known as an initial condition specifier determines whether a manual selection menu should be presented to the operator when the presence of a data storage device is first detected or whether automatic identification beginning at the first database entry is to be attempted.

Step 1 of the algorithm includes the action of setting the variable known as the risk restriction indicator to 'on'.

It should be noted that the database entries are so ordered that if any of the identification procedures are deemed not to pose a risk of corruption  
 5 for any of the data storage devices in the set then they are to be conducted initially.

According to step 4 of the identification algorithm an identification procedure is executed if either the risk restriction indicator is off or the risk restriction flag for the card is off. If, however, the risk restriction  
 10 indicator is on and the risk restriction flag for the particular identification procedure is on, one of the actions (1) to (4) is taken.

Steps 1, 3, 4 and 8 allow the database designer to specify when manual intervention should take place. The manual selection menu presents a list of all data storage device types in the set. The operator may choose  
 15 either to terminate the procedure or select a data storage device type and to begin the identification procedure starting at the associated entry in the database. Furthermore, the database designer can also specify the circumstances in which an automatic identification attempt should take place despite a risk of corruption.

20 Where the data storage device handling terminal comprises a plurality of interfaces there will be a database for each physically different interface and each interface would be capable of handling a certain category of data storage device types.

## CLAIMS

1. Apparatus for communicating with any of a set of data storage devices, the set of data storage devices having respective communications protocols, the apparatus being operative to execute an identification procedure so as to determine whether a particular communications protocol is compatible with a particular data storage device, and the arrangement being such that, in use, there is provided risk indication means which provides an indication of whether there exists a risk of corruption of at least one data storage device in the set of data storage devices by a particular identification procedure.
2. Apparatus as claimed in claim 1 in which the apparatus is provided with data on courses of action to be taken in the event of the activation of the risk indication means or in the event of an unsuccessful identification attempt.
3. Apparatus as claimed in claim 1 or claim 2 in which the apparatus is provided with data on courses of action to be taken for a particular identification procedure in the event of activation of the risk indication means or an unsuccessful identification attempt.
4. Apparatus as claimed in claim 3 in which one course of action for a particular identification procedure in the event of activation of the risk indication means or in the event of an unsuccessful identification attempt comprises allowing for a subsequent step of the operation of the apparatus to be determined manually.
5. Apparatus as claimed in any preceding claim in which the apparatus is provided with a database which comprises a section corresponding to each type of data storage device in the set.

6. Apparatus substantially as hereinbefore described with reference to the accompanying Figures.





INVESTOR IN PEOPLE

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**Claims searched:** 1-6

**Examiner:** Owen Wheeler  
**Date of search:** 11 October 2001

## Patents Act 1977 Search Report under Section 17

### Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.S): G4A (AFGDC, AMC) H4P (PPEC, PPF, PSEP)

Int Cl (Ed.7): G06F: 13/42; G06K: 7/00; H04L: 5/14, 29/06

Other: Online: EPODOC, JAPIO, WPI

### Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
A	EP 0856807 A2 [TOSHIBA]	
A	WO 00/77717 A1 [CUBIC]	
A	WO 99/48039 A1 [MASTERCARD]	

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.